

The People's Republic of China:

Tracing the Physical and Economic Development of the World's Most Populous Country

And the Implications of its Success or Failure



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Introduction

The 21st Century belongs to China. Whether time unravels in the form of a vastly increased standard of living for its population, which is a large portion of the entire world- or whether unsustainable habits and improper development cause concerns for human sustainability far beyond the borders of China proper- rests in the hands of the present time. China's future depends on *right now*. Are they developing in a responsible manner?

There is (and has been for most of the last two centuries) a persistent temptation among developing countries to follow the ways of the West- to consume as they do, the politicize as they do- to follow steadfastly in *their* footsteps. We have however reached an event that proves the necessity in *not* following the ways of the West: the development of the People's Republic of China. This will be discussed in the next paragraph and throughout this paper, however let us preface the following section with the fact that China is teetering dangerously close to that precipice which is the "American Dream". For various reason which will be discussed, China must *not* follow our dream but instead create their own...

Following the American Dream

The chief culprit of this temptation is the Western ideal of capitalist consumption. As China becomes wealthier, and thus her people are afforded more and more economic opportunities, they look to the West (or, better, the West looks to them) in order to satiate the myriad needs of the modern consumer. This takes shape in many forms: new automobiles, larger homes with more green space, clothes, jewelry, etc [see Figure A].



Figure A.
China following American consumptive habits is unsustainable. Sprawling developments such as this are not culturally sensitive nor are they sustainable.

The problem, however, is the fact that China is not America. In the United States a population of roughly 285 million persons lives within a geographic area roughly the same as China [see Figure B]. In China, 1.3 billion persons occupy that area.

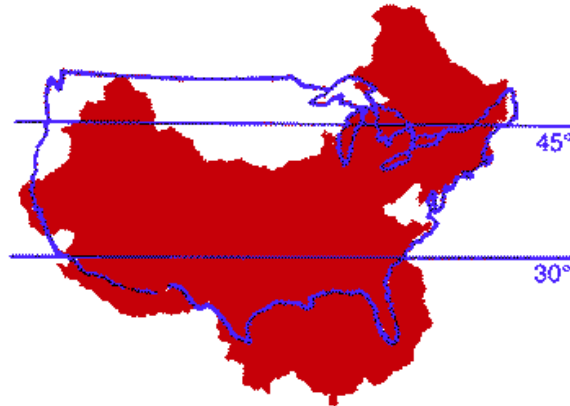


Figure B.
The spatial area of China is roughly equivalent to that of the continental United States.

Topical Overview and Evaluation of Current State of Infrastructure

Existing cities

The state of existing cities in the interior of China varies greatly by province. Generally but not absolutely speaking, infrastructural development and economic disparities are less pronounced the closer the province is to the country's Pacific Rim. Hunan Province serves as a balanced example of the current state of interior development, and the following discussion will use this province as a base.

The medium sized cities of China's interior— which will become the economic base of the country in the ensuing decades— reveal in stark fashion the state of transformation in China. The urban fabric is like that of a patchwork quilt [see Figure C]. There can be intense development occurring in one area which includes new utilities infrastructure and all of the elements of a

mature infrastructure. Adjacent to this development will appear to be another country, without paved roads and without proper sewage. Rickshaws replace automobiles on the makeshift roadway.



Figure C.
Yiyang, Hunan.
In this transitional phase of development, many areas reveal stark economic and physical contrasts.

These cities often contain their own sub-regions of relative development. An example is the city of Yiyang (pop. 210,000) in northern Hunan. The section of the city north of the river Zi Jiang is mostly underdeveloped. This part of the city lacks the infrastructure and containment systems to contain flooding, and every few years the area becomes submerged in water. The chronic power shortages that China faces often leave the entire half of the city without power for days and weeks on end— the residents cope by preparing coal fires in their homes and lighting kerosene lamps during the evening.

The south side of the city, on the other hand, contains more wealth and the bulk of administrative

services in the city. Flood levels are contained and power outages only occur for minutes and hours instead of days and weeks.

Progress appears when one considers that the whole of Yiyang lacked any substantial flood-containment mechanisms only a decade ago, there were only a few paved roads in the city, and (miniscule) investment occurred on a city-wide level instead of a regional and now, sometimes, national level. That said, 15 years ago residents of the city could bathe and drink from the Zi Jiang River— today pollution renders these options unthinkable.

Topical Overview and Evaluation of the Future State of Infrastructure

Newly Forming Cities and Regional Networks

While the Pacific Rim urbanized areas boast for the most part a well-integrated system of regional urban networks, the state of regional networks in the interior of the country is in need of further development. There is little efficient interface between major urban centers in the interior, and in many cases this lack of a cohesive interface stifles economic growth and development.

Thus what follows will be an extensive evaluation of the planned urban networks in the interior of China— their feasibility, environmental costs and economic gains, and their potential consequences.

The planned network of new small-medium sized cities in China's interior is on a scale absolutely unsurpassed in urban history. Over 500 million now rural and semi-rural persons will be migrated to new urban centers over the next 3 decades, at a planned rate of approximately 14 million per annum [see Figure D]. This requires an urban and regional development plan the scale of which has never been attempted. Herein lies the chief crisis of Chinese Machine: if properly planned and implemented an economic engine will be forged that will exist unrivaled in the world. If the myriad variables are not developed to a sufficient balance; if the urban and regional networks rely predominantly on autonomous transportation media; and if material luxury and the gluttony of Western 'progress' continue unchecked, there will be a calamitous upheaval in the world's resource base— China will not only affect China but also the rest of the world.



Figure D.
*Locations of planned medium (orange), large (red)
and satellite (green) cities in China.*

The Development Plan

China has in its master plan the intention to construct approximately 900 new cities during the next 25 years, moving just under 500 million rural persons into newly formed urban areas. What is the spatial positioning of these new urban networks and are they being designed with the inclusive term 'sustainability' in mind?

Around 60% of these new cities are being constructed along the country's physically, economically and culturally dominant river, the Yangtze [[again, see Figure D](#)]. This is in some part due to the physical and economic transformations taking place due to the construction of the Yangtze Gorges (or Three Gorges) Dam. This dam upon its completion will have displaced approximately 1.2 million people— a relatively small number in China— though the economic opportunities it will afford along its new coastline are tremendous.

Resettlement with Development

One of the axioms of the "Great Migration" from rural to urban areas is the concept of Resettlement with Development (or RWD). RWD dictates that involuntary resettlements must occur with a plan to improve the lives of the settlers or, at least, restore their living conditions to pre-resettlement levels. In fact, this

concept is widely seen as a positive development opportunity for the various effected regions and for the country as a whole. In practice, how effective is this policy in improving the living standards of settlers and in providing a sustainable infrastructure for the future?

China's Rwd policies are seen as the model for other developing countries to follow. One product of China's communist structure is that it allows for the almost complete central planning of current and future urban systems. This means that spatial economies will develop in a way that is most conducive to the overall quality of life of the persons living within those regions. It also means that cities and regions will develop in a way that is sustainable into the future and not based purely upon competing municipalities, such as is the case in most of the United States (the state of Michigan being a prime example of this).

Energy: Present and Future

China is experiencing quite extensive growing pains. The country's gross product is growing at an average of 9% annually, and as mentioned previously over 14 million persons per annum are being urbanized. However the country is finding it difficult to meet the energy needs of this rapid urbanization and industrialization. This problem has

become much more pronounced in the last decade and is set to continue well into the future. What is being done in the country of China to satisfy its power hunger?

All across the country cities experience power shortages semi-daily in the winter and multiple times daily during the summer. In fact, some of the most impressive skylines in Asia show no contrast against the night sky— a dictate by the Central Government in order to curb those cities' massive energy consumption.

China has an ambitious energy policy for the next few decades which will attempt to satisfy the constantly growing energy needs. China just announced plans to build 43 nuclear reactors over the next twenty years. Some of these reactors will be of a state-of-the-art "*Prototype Fast Reactor*" series of reactors [see [Figure E](#)], which will "lift the utility rate of natural uranium from one percent to 60 to 70 percent with a pressurized water reactor" (Xinhua News Agency, January 2005). Commitment to such developments are a sign that China is willing to pay higher prices for high-technology products and to embrace the forefront of technology in order to improve the well-being of the economy and, indeed, the country as a whole.

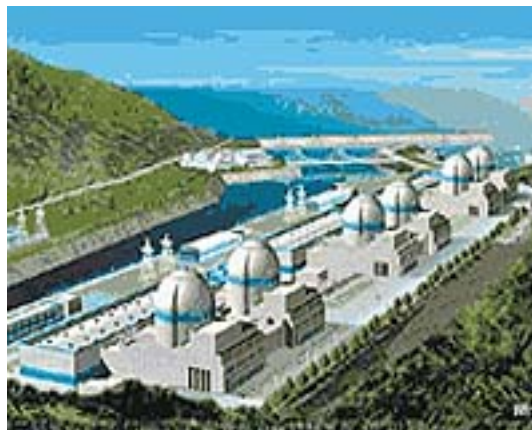
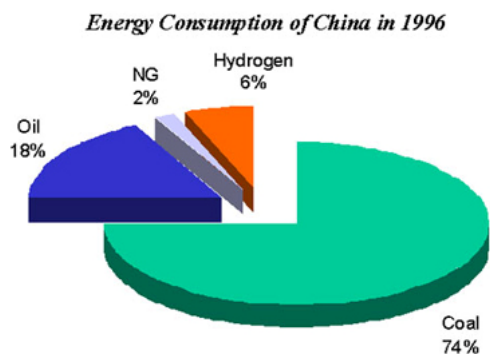


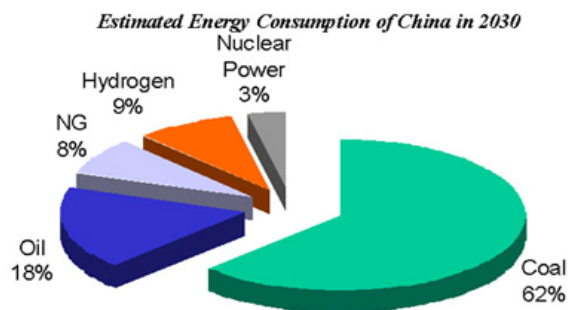
Figure E.
This new PFR nuclear technology will revolutionize nuclear reactors in China, and put the country at the forefront of the field of nuclear technologies.

The country's energy distribution in 1996 is as follows:



Coal is obviously the major source of energy for China. Noteable is the 6% hydrogen power usage from the myriad dams that China has built in the past several decades.

Below is an estimate of China's energy consumption roughly 25 years from now, in 2030:



Note that although a massive amount of reactors are planned to power the country, they will still only account for approximately 3-4% of total power consumption in China—such is the amount of total power required to power the country. We must also note the marked decrease in coal as a total percentage of the energy consumption pie. Coal is plentiful, though it is dangerous to mine, and, until methods of refinement remain at the technological status they are now at, very dirty. Thus energies such as natural gas, nuclear power, hydroelectric, and (though to a very small degree) biomass all provide cleaner alternative sources of energy for China.

Current State of Local, Regional and National Transportation Networks

China has serious spatial concerns when it comes to how to accommodate the movement of the largest population in the world. Countries all over the globe, with the United States at the vanguard, have made the mistake of prioritizing autonomous circulation networks over organizational networks. The result is pollution, mass-waste, congestion, and unsustainable semi-urban developments that consume space and encourage the uniform blankness of isolation. China cannot make this same mistake. Does the country realize this, and are plans being encouraged that lead away from such a result? The

answer is a vague 'yes and no', and will be examined in depth.

Railway Network

Plans are in motion to transform many of China's primary rail lines into ultra-modern, high-speed/high-capacity networks. Are these planned super networks capacious enough to support the next 40 years of urbanization by China's populous interior? Is the government's investment of a high enough quality as to ensure a quality development for the future? With the second-largest currency reserves in the world, valued in the hundreds of billions USD, and with a large capital surplus that grows each year, the government is not 'cutting corners' when it comes to railway investment and quality technology. However, we need to first examine the current state of railway infrastructure and the unique situation which China faces.

A capacious and efficient railway network is essential to a country like China. The country has an approximate spatial size of the United States, yet contains a population of 1.3 billion people. For a national transportation network to be sustainable it must operate in an organized and predictable medium; if the country were to rely on an autonomous network of vehicular arteries

economic growth would be continually hampered by bottlenecks and congestion. A state-of-the-art, interfaced network of rail is absolutely necessary.

The first questions are as follows: what is the state of China's national and regional railway networks, how much needs to be done to overhaul them, and what progress is being made?

China's national railway network as a whole can be described as inefficient, slow, and in need of a major overhaul [[see Appendix A for a map of the current Chinese rail network](#)]. It also suffers from frequent bottlenecks that stifle economic growth to a substantial degree. In 2003, for example, there were 43 bottlenecks along various routes resulting in an estimated 30% loss in gross product [[see Figure E](#)]. A primary reason for the network's inefficiency is the fact that it is government-owned and operated. There has been a modicum of discussion within the central government to privatize the network; however, little real progress towards such a conclusion has yet to be made and, very likely, China's railway network will remain under the control of the central government.

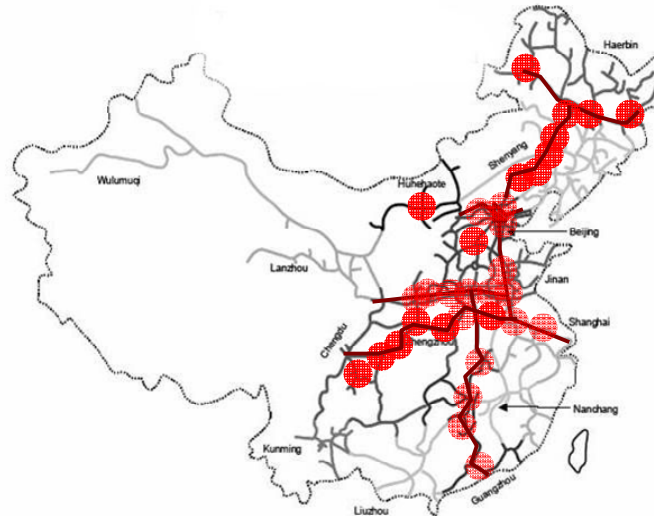


Figure E.
Most bottlenecks occurred between industrial centers and major ports such as Shanghai, Tianjin and Guangzhou

It is typically an axiomatic thought that government-run industries— whatever those industries may be— are less efficient than their privately-owned counterparts. This is currently the case in China as far as most industries are concerned. However, the government has been making strides in its operation of the Chinese railway system. The system has the potential for enormous profit, as it is currently the unchallenged leader in railway traffic density [see Table 1].

Table 1: Density of Traffic on Selected Railway Systems

	Passenger mean journey length (km)	Mean train load (pass)	Freight mean shipment length (km)	Mean train load (tonnes)	Traffic units per route-km (million)	Train-km per route-km
CR (5)	347	998	806	1634	30.00	20,456
IR (94)	79.9	809	703.6	1158	8.93	12,306
BR	41.0	89.0	128.3	343.2	3.01	26,055
DB	41.8	107.8	221.8	305.9	3.12	22,405
SJ	78.5	103.4	349.5	471.0	2.53	9225
SNCF	76.4	200.2	358.7	303.7	3.30	14,313

Source: Nash and Wu (2000), Table 3.

While major transformations have yet to be made in price regulation, significant strides can be claimed in route planning, network expansion, planned-technological renovation, and investment. There are currently over 11,300 miles of new track planned to be built over the next five years in the interior provinces of China [see Figure F], with total investments reaching \$15 billion USD (China Ministry of Railways).

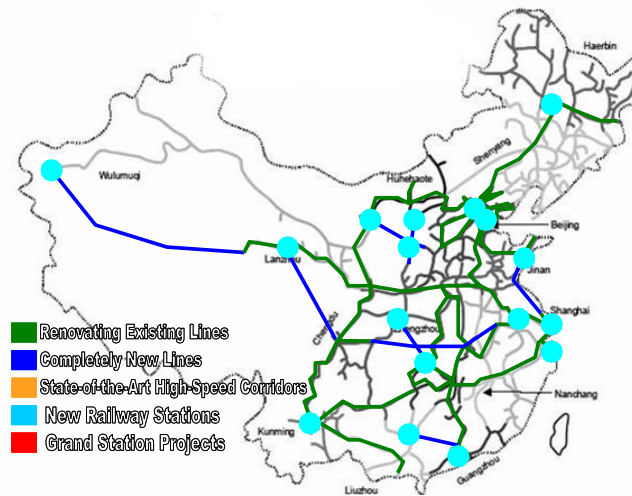


Figure F. A massive amount of new rail lines are planned throughout the interior of China.

From the ports to the interior

The ports of Yokohama and Rotterdam are of comparable freight-volume to ports like Shanghai and Ningbo. Theirs are mega-facilities of seamless efficiency, with an enormous infrastructure to handle freight, sort it, and transport it to all parts of Japan and Europe with astonishing speed.

It is estimated that half a trillion USD is lost in potential GDP growth from the inability of China's port-freight to efficiently reach the interior of the country, and from interior-produced exports to reach the Pacific Rim ports. The Central Government realizes this problem. So, what is being done to alleviate the mountainous port congestion, and render the country's port-to-interior freight-transit networks capacious and efficient enough to handle such volumes? The answer is a lot, however annual port volume is growing [see Table 2] at a rate unseen since the meteoric rise of Yokohama and is set to not only surpass Rotterdam and Singapore but reach levels that, in time, are untested anywhere on the planet.

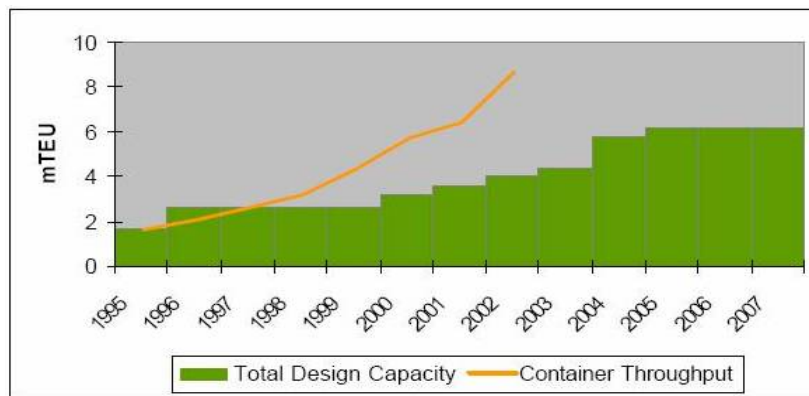


Table 2. Current capacity of the Shanghai Port.

State of the Economy

China's economy has expanded several-fold over the past two decades— and all indications point to the fact that this expansion will continue well into the future.

However, just how is this expansion unfolding- and is it taking place in a manner that is conducive to balanced economic development?

In 1978 the Central Government of China stated that several Special Economic Zones (or SEZ's) will be implemented along the country's Pacific Rim. These zones would allow certain amounts of 'openness' to foreign investments and were supposed to be magnets for investment both domestically and from abroad. These SEZ's have fueled the Chinese economy for the past twenty years and now represent the potential of the Chinese economy as a whole. However, what effect has this had on the interior of the country where the vast majority of the population resides?

The Central Government has established that the economic development of the interior of the country is the key to economic growth and sustainability for the future. The SEZ's are meant to be locations where foreign investment can take place and where the economic benefits will eventually seep into the interior. This has so far proven true to an extent in the interior, though much is to be done if the inland provinces are to be economically equal to their coastal counterparts.

While there exists a large economic disparity between the wealthy coastal provinces and the poorer inland

provinces, a great deal of domestic investment has taken place inland and tens of millions of rural persons are being relocated to newly formed interior urban areas— areas that are said to be the key to the Chinese economy in the future.

While the overall disparity in income between the inland areas and the Pacific Rim is pronounced, this is not to say that inland urban residents suffer from a greatly reduced quality of life. The reason for this is Purchasing Power Parity (or PPP). While those residing in the inland province of Sichuan, for example, may earn 1/3 to 1/2 of the income of those living in Shanghai, the cost of living in Sichuan is of a comparably lower rate. This produces a common misconception in those taking a cursory glance at the economic disparities in the various regions of China.

Conclusions

A view into the future

Imagine if a Metropolitan Tokyo existed side-by-side with another 30 million+ super-metropolis, and another, on and on into the horizon. The term megalopolis would need to be augmented. This is the future that China's 1.3 billion will live in— for better or for worse.

There are few true crises that have the magnitude to produce the unparalleled economic superpower of the 21st

Century, or the most detrimental human waste the world has yet seen. The decisions China makes today as to its urban structure will have implications well beyond the country's borders, as the ecological balance of the planet could rest in the decisions now being made.

A transportation super-network unparalleled

China's Central Government has plans- many underway, as we have seen- for an eventual complete overhaul of the country's national transportation network, chiefly concerning the two primary methods of national transportation: aviation and rail.

Rail

The eventual completion of these long term plans will present a transportation network that is unequalled anywhere in the Asian world in terms of its sheer scope. When the Chinese rail network is complete, there will be roughly 230,000 miles of track- roughly equivalent to what the United States possesses now. However this network will be fully utilized and will be of a state-of-the-art grade [see [Figure G](#)], capable of transporting over a billion people per year. The dozens of freight-rail bottlenecks that occur today will be a relic of the past.



Figure G.
China has not spared much expense in order to build the country's new railway infrastructure and facilities into world class operations.

Aviation

As mentioned previously in this paper, there have been major improvements in the national air network of China during the past twenty years. Upon the completion of China's 20-year transportation plan, the country's airport network will be the most advanced in the world, and capable of handling more passengers and freight than any other country, including the United States. The reason for this is the fact that China spares no capital expense in renovating its airport infrastructure completely, and the central government's control over the renovations ensure a minimal amount of 'red-tape'. The airports that have been built in Shanghai, Beijing, and Guangzhou incorporate more advanced technology and designs than anything the United States currently has to offer. This trend will continue across the country's Pacific Rim, and, slowly, into the inland provinces. The transportation revolution has begun in China and, when finished, will boast itself as the most

advanced network the world has to offer in terms of sheer capacity and its embrace of the latest technologies.

Could China Survive if it Followed a Capitalist Model Such as the United States?

This is a valid question that deserves its place as the capstone of this paper. In theory a Communist structure provides a balanced standard-of-living for all— it is the very definition of egalitarian central planning.

However in past and present experience Communism has produced totalitarian dictatorships and massive social and economic turmoil. The model of Communism that China is now following can be said to be of a hybrid form, possessing both semi-capitalistic qualities and central state planning. From the point of view of sustainability, is it a matter of sheer necessity that China remain at least a semi state-planned country?

As mentioned in the introduction to this paper, if China consumed per-capita the amount of oil that the United States does, it would require 80 million barrels per day— currently the entire world's production. Similarly impressive, if China possessed the same amount of automobiles per capita as the US, there would be over 800 million autos in the country. These numbers are simply impossible from a practical standpoint. However, what would stop China from traveling down this course if the

state allowed the spatial economy and physical infrastructure to develop without any restrictions? Perhaps *some* of the restrictions the Chinese government places on its people are in place in order that the country does not collapse in on itself in twenty years due to a want of the "American Dream".

The problem that exists, though, is that as the Chinese become more educated and as their economy grows and their country opens more and more to the rest of the world (which I am in no means arguing is a bad thing—if handled correctly), they will demand more and more personal liberties. This is absolutely what needs to take place in order to ensure basic human rights. However, when the derivatives of this liberty means unlimited restrictions on automobile purchasing, a breakdown of regional control over the development of urban areas and transportation networks, and mass-consumptive habits— the country will face a crisis in that these liberties will lead to the world's inability to support such habits.

In conclusion, China must develop its economy and spatial structure according to a centrally planned authority that recognizes the limits of the world's natural resources and the country's ability to support mass consumption. At the same time it needs to relax its

control over what we in the West deem as basic human liberties, such as freedom of religion and the respect of personal privacy— a control that is presently tight and shows little sign of relaxing without maintaining the other forms of necessary control. In a way, China's political and economic sustainability are built upon a house of cards- one card cannot be removed without the entire system wanting to move with it.

Appendix A



China's rail network is extensive but currently inefficient.

Selected Works Cited

- I.** Tung-Hsiao, Fei. **“Rural Development in China”**. The University of Chicago Press, 1989.
- II.** Goodman, David S.G. **“China’s Regional Development”**. The Royal Institute of International Affairs, London, 1989.
- III.** Oi, Jean C. **“Rural China Takes Off”**. University of California Press, 1999.
- IV.** Nyberg, Albert and Rozelle, Scott. **“Accelerating China’s Rural Transformation”**. The World Bank, 1999.
- V.** Statistics Bureau of China. **“Urban Statistical Yearbook of China”**. Statistics Press of China, Beijing, 1996.
- VI.** Newman, P.W.G. and Kenworthy, J.R. **“Cities and Automobile Dependence: An International Sourcebook”**. Gower, Aldershot, England, 1989.
- VII.** Gordon, D. **“Steering A New Course - Transportation, Energy, and The Environment”**. Union of Concerned Scientists, 1999.
- VIII.** Hook, W. and Ernst, J. **“Bicycle Use Plunges: The Struggle for Sustainability in China's Cities”**. Sustainable Transport, 1999.
- IX.** **“Energy for sustainable development in China”**: report at the end of Phase II to the China Council on International Cooperation on Environment and Development.
- X.** Yuefeng, Duan and MacDonald, Brooke. Working Paper Number 14: **“Involuntary Resettlement as an Opportunity for Development: The Application of ‘Resettlement with Development’ In the People’s Republic of China”**. March 2004.